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SCIENCE

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MSS. intended for publication and books, etc., intended for review should be sent to Professor J. McKeen Cattell, Garrison-on-Hudson, N. Y.

THE MUTUAL RELATIONS OF MEDICAL PROGRESS AND THE PHYSICIAN[1]

SOME students of literature tell us that there are but seven different stories in the world. I should be inclined to add that there were but three different addresses for an occasion like the present.

Thus it is possible to select a chapter in medical history and revive the past; or discuss some striking achievement of the day and illuminate the present; or finally, to choose for consideration problems, the solutions for which are still in the making, and thus attempt to forecast and to mould the future.

It is from these problems that I have made a selection for this occasion and I purpose to speak on the mutual relations of medical progress and the physician—for you are physicians—in the nascent state, to be sure—but like the freshly liberated hydrogen to which the adjective is most often applied—capable of vigorous activity.

To say anything really new to you upon the topic here set down would be most difficult. We are all in the position of the old philologian who, when asked to explain why he gave no lectures, replied that he had not yet been able to get together a sufficient quantity of *new* facts to fill an hour. For the most part we who speak are obliged to overlook this unpleasant circumstance and endeavor to present familiar ideas in a new form—trusting by a happy presentation to drive them home.

To be sure, all of us are wonderfully pro-

[1] Address given at the eighty-fourth annual commencement of the St. Louis University School of Medicine, June 5, 1913.

tected against the infection of ideas—but it sometimes happens that our resistances are particularly low and if then the idea be "exhibited" in a peculiarly virulent form, it "takes" and the experiment is counted a success.

I turn now to the topic of the hour. The notion of progress which I wish to use neglects sheer turmoil and in a measure mere accumulative work—and puts the emphasis on our advance in leading ideas and guiding principles.

It is your relation then to such progressive changes in medicine, the effect which these changes have on your intellectual life and economic opportunities, and in return the influence which you, as physicians, can exercise on the advancement of your science, which I purpose to present.

My point of view is that of the laboratory man working in a field cognate to medicine, and my attitude is one of encouragement to yourselves and sympathy with the ills of the community that needs your aid.

By way of introduction let me call your attention to the fact that the idea of progress for humanity—so familiar to us now—is really rather new.

The most ancient view is well illustrated by an allegory taken from an Arabian manuscript of the thirteenth century. I use the translation given by Lyell in his "Principles of Geology."

It serves to show how, in the absence of sufficient records, changes may be easily forgotten, and it runs as follows:

> I passed one day by a very ancient and wonderfully populous city, and asked one of its inhabitants how long it had been founded. "It is indeed a mighty city," replied he; "we know not how long it has existed, and our ancestors were on this subject as ignorant as ourselves." Five centuries afterwards, as I passed by the same place, I could not perceive the slightest vestige of the city. I demanded of a peasant, who was gathering herbs upon its former site, how long it had been destroyed. "In sooth a strange question!" replied he. "The ground here has never been different from what you now behold it." "Was there not of old," said I, "a splendid city here?" "Never," answered he, "so far as we have seen, and never did our fathers speak to us of any such."
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> On my return there five hundred years afterwards, I found the sea in the same place, and on its shores were a party of fishermen, of whom I enquired how long the land had been covered by the waters. "Is this a question," said they, "for a man like you? This spot has always been what it is now." . . .
>
> Lastly, on coming back again after an equal lapse of time, I found there a flourishing city, more populous and more rich in beautiful buildings than the city I had seen the first time, and when I would fain have informed myself concerning its origin, the inhabitants answered me: "Its rise is lost in remote antiquity: we are ignorant how long it has existed, and our fathers were on this subject as ignorant as ourselves."

To the people of this legend not only was the past unknown, but for them the future also must have shaped itself as an endless prolongation of the present. To talk to them about the scientific use of the imagination would have been a thankless task. They merely drifted on the stream of time.

When, however, the historical records were at hand and the great events were noted, attention turned to the possible changes in man himself.

During the twelve hundred years when western Europe was adjusting itself to the new order of things, men looked back to the great classic past as something beyond repetition or improvement, counting its leading men as of a vanished race of intellectual prodigies.

In his studies on "The Mediæval Mind," Taylor quotes a writer of the time as follows:

> Bernard of Chartres used to say that "we were like dwarfs seated on the shoulders of giants. If we see more and further than they, it is not due to our own clear eyes or tall bodies, but because

we are raised on high and upborne by their gigantic bigness.''

Here it is conceded that men changed, but the change was rather backward and for the worse.

In harmony with this idea we find three centuries later, when Vesalius was founding modern anatomy, that the discrepancies between his observations and those of Galen—whose teachings were then dominant—were explained by the fact, that since Galen wrote, the human body had deteriorated.

It is only since we began to command the forces of nature through the development of chemistry and the power of steam that the modern notion of progress has taken a firm root, because only since then have important discoveries followed one another with sufficient frequency to give the impression of a progressive series.

At present we somewhat readily concede to the past the greater men, but when asked to compare ourselves with our representatives of an earlier time there is a strong inclination to conclude that we ourselves are the better, for we can do so many things which they could not.

When one looks critically at the matter and endeavors to distinguish between material advances and biological improvement, this illusion disappears. It is evident that despite the external changes, the human being has remained almost unmodified. Although the *average* length of life has been increased by conditions which permit a greater number of people to approach old age, yet we see no evidence that for the individual the normal span of life has been extended. Although we are more guarded from pestilence, famine and war, and relieved from the distractions which they cause, yet equivalent emotional strains have replaced these distractions. Although for a number of people the economic situation makes the pursuit of food and shelter a less insistent occupation than before, yet into the vacancy so left there stream at once new obligations and unexpected interests, while at the same time there is no evidence that our minds have become either more acute or more vigorous. Nevertheless, as heretofore, each of us must live on twenty-four hours a day.

In brief, then, social development protects us and the preservation of past accomplishments leaves us free to attempt new ones, but within historic times, man—the dominant power on the earth—has changed but very little, if at all, while here and there the best achievements of his remoter ancestors still mark the high levels of human thought.

Nevertheless, in a sense, our opportunities are much increased. The world, at least the active part of it, has been more firmly knit together. We can get our bodies, our voices or our writing carried about the earth at marvelous speed and with wonderful safety.

A few uncommon languages still hinder intercourse between the nations, but in the main it is easy to learn precisely what is going on now and what has gone on for the last fifty or a hundred years. Ideas travel with the ease of Aladdin and his friends and everywhere men are testing, trying, proving and attaining new results.

This opportunity to try rapidly and on a large scale any new ideas that require to be tested yields in return a great mass of conclusions and judgments which must be considered both quickly and seriously—lest confusion follow in their train.

As a consequence of this condition one has at least the opportunity to think more often and more rapidly than a generation ago—not because the modern mind is normally more active, but because the food for thought is more abundant and more varied.

At worst, this brings distraction; while at best, it makes us frugal and foresighted in our mental life. At every turn, therefore, the study of efficiency is forced upon us—all the way from the correct position of our inkstand on the desk to the arrangement of our thoughts.

The interests which pass before us in a ceaseless train may prove almost embarrassing in their abundance, unless we are prepared for the experience.

Thus a man often finds himself in a position analogous to that of the courteous gentleman who felt that one should always hold open for an approaching lady any swinging door. Once at the main entrance of a large department store he began this practise early in the day. Closing time found him still at his post, for never through the long hours had the stream of passing ladies been sufficiently intermittent to allow him to move on without some damage to his self respect.

I say we find ourselves in quite an analogous position to this with regard to current ideas, and for this reason many of them must be resolutely disregarded. It is something of an art to use a protective inhospitality towards these many vital interests without creating by this act a feeling of dislike for those excluded, and thus weakening one's sympathy by the lack of use.

We may recall here as having particular fitness that view which regards life as a continuous adjustment between internal and external conditions.

As we grow older this continuous adjustment is made only with increasing difficulty. We become enmeshed in our special habits and loaded down with our private information—so that we do not move lightly or change with ease.

Perhaps one of the most striking results of the rapidity with which new problems and new ideals follow one another is the attitude of the active world towards the man of sixty, or shall I say, fifty.

Time was when the progress of ideas in a community moved at so moderate a pace that by gaining much experience in youth, a man in old age could have a store of facts as the basis of wise judgments.

To-day we have the startling situation that the matters on which sound judgment is demanded often belong to a group of events and happenings that have occurred since the man interrogated was in a position to get the needed experiences.

Such a one may be wise in the matters to which his own growing period relates—but unfitted to meet the questions of the moment which so often arise from situations developed since that period was closed. So it sometimes happens that a man advanced in life may belong not to his own generation, but to that which has preceded it—and there is a misfit.

Yet experience is ever and always the foundation of wisdom, and it follows that the period of acquisition must be prolonged. The existence of this situation is beyond dispute. Some method of adjustment to it must be found, and, if need be, we must revise our intellectual manners. Speaking broadly, we have perhaps been leading a somewhat thriftless mental life and needlessly curtailing the period of growth.

Suffice it to say that the demands on our attention, numerous as they are to-day, are bound to be more numerous a decade hence, and the first practical step is to employ a method of selection among the things to which one attends. We must imitate the miner. Gold is pretty widely distributed. There is said to be one grain in every ton of sea water. The city of Philadelphia stands on a brick clay deposit which contains enough of this precious metal to buy

a navy. But to recover this gold would cost many times its worth. One obtains gold, to be sure, by working in these places, but only at a great price. The distribution of knowledge is analogous and one must work or mine—to continue the simile—only where it really pays to work and leave the scattered dust of information to be dealt with by more effective methods.

There is one further aspect of the increase in knowledge and the rapid alteration in point of view that still needs a word. One may safely predict that what you have learned of method and right reasoning, such experience as you have gained in the art of observation and induction and the criticism of your own conclusions, will stay with you throughout life. So will many of the bits of knowledge which have stood the test of years and thus inevitably survived many an assault. These are the relatively stable things, and by virtue of that fact they can be expressed in a few words, without elaboration.

I desire to impress on you, however, that we must regard the knowledge of our time for the most part, not as final or ultimate in any rigid sense, but merely as the best available at the moment—certain to be improved with the advance of time, while, nevertheless, valuable and worth while in so far as it aids us to control natural phenomena, like disease.

In holding that in large measure our knowledge is open to change and to improvement, often of a fundamental character, we admit that in this respect our generation is only a repetition of those gone before, and this admission should make us very sympathetic with the past. No earlier age is to be discredited because of its tools. Primitive man with his stone axe or copper knife is to be rated by the use he made of his simple inventions. Thus in medicine your predecessors are to be esteemed for the intelligence with which they used their rough instruments and fragmentary information. Nothing is more certain than that the generations which follow us will also need to mingle mercy with their judgments.

Your knowledge then and the principles with which you work must be regarded in a twofold way: for each present moment, fixed; but for the future, transient.

When an experiment is in progress to test an hypothesis, the hypothesis for the time must be held as if rigidly true, for it is the hypothesis which is to be examined.

When, however, repeated tests fail to support it, then it may perhaps be put in a psychological museum, as a matter of historic interest or relegated to the scrap heap—a procedure usually to be preferred. The reason for putting emphasis on this point of view is found in the fact that it is quite contrary to one which, I regret to say, has often been tacitly encouraged, namely: that by learning rather dogmatically certain things through a small number of years, one was thereby fitted to care for the sick, and also thereby largely relieved from the need for further mental growth. Against such doctrine it is my desire to protest.

Nothing could be more unfortunate if medicine is to be regarded as a science and an art. As a matter of fact, the mental attitude evolved from the study of medicine depends but little on the precise subjects to which attention has been given. One may have studied more or less in many given directions—but if in his studies he has been occupied with subjects involving important and fundamental ideas, topics therefore suitable for training, if his instruction has been received from men who were not only informed on their subject, but contributing to its advance, he is well prepared for the problems of the physician.

In the older days, especially in western

Europe and her colonies, the apprentice system was in vogue in medicine. Theoretically there is no better. The apprentice learns from his master the history and principles of his science, receives correction and encouragement and watches at close range the master's methods and the exhibition of his skill, and has the opportunity to try everything himself. The system suffers mainly from the paucity of masters.

In passing I should like to recall your attention to the fact that exactly these advantages were those urged for the laboratory method of instruction when the personal contact of the teacher with a few chosen students were the features emphasized, and these relations still remain the ones for which we strive. Yet in the competition between the several methods of instruction during earlier centuries the didactic form prevailed—for reasons too obvious to need recounting here. From the first the weaknesses of the method were apparent, but teachers were in a measure misled by the persistent hope that through the spoken or the written word or through the picture of a thing or act they could effect in the nervous system of the student those changes which the independent act and thought by the individual himself alone can cause. We now know that if an animal be carried through a maze—even many times—it does not learn its way. It must go itself. The same is true for man.

So at the present day more training of the eye and hand and of the powers of observation and of inference are demanded. These pave the way for the many attainments which are to be exercised within the frame set by the philosophy, history and scope of your science. Through these attainments and within this frame you are to work in the light of the best knowledge to be had, realizing that among these conditions knowledge is the least stable and the most likely to take a turn for the better. Nevertheless, when one has reached the point of view that our knowledge is in a constant flux, there are some common difficulties which at once appear. Guided by the conviction that learning advances, we are sometimes in our enthusiasm misled by the notion that each new thing is probably an addition to the fund of truth.

But old men shake their heads. The life of a new discovery has been said to be for three years, and after it has survived for that time, it too often fades away.

I have a personal interest in this matter, for the laboratory is my habitat. It must be admitted that the atmosphere there is sometimes such as to force intellectual fruit unduly, and it may even be put upon the market while still quite green; but we grow wiser with experience, even in the laboratory, and the future I am sure will contain proportionately fewer premature revelations than the past. But leaving aside the group of false alarms and false hopes which have gone far to discredit the influence of the laboratories, there still remain the significant and well-grounded results which they have furnished. To these the practitioner must be alive and responsive in the same manner as he is alive to clinical advance, and not allow either prejudice or indolence to stand in the way of his utilization of these new facts for the benefit of those whom he is called to aid.

When the ideal relation is established, as it surely will be, between the physician and the well springs of new knowledge, not only will the practitioner find continuous aid and stimulus coming from the laboratory, but in return will use his best efforts for the extension and increase of the work which laboratories do; substituting enthusiasm and cooperation for the less helpful relations which sometimes appear.

It must be admitted frankly that in this

presentation the obligation seems to rest heavily on the physician, for he is urged to welcome and incite the activities of those who are bound as a result of these to ask him continually to replace older by newer knowledge. But it must be remembered that the interests of the community enter as a factor here, and since the community is better served by this, the equation is well balanced.

Sometimes it would appear that the thought of service had departed from its ancient place of honor—but in truth, it has merely changed the form of its expression. In the olden time the long cross country drives of the friendly doctor to a distant patient were justly presented to us as part of the hardships of a devoted life. Now the scene has shifted a bit, long journeys over the literature, some of it often rather rocky and uneven, or hours devoted to tests and exact determinations in his office laboratory, or even to experiments which hazard life, take the place of the earlier expressions of devotion and accomplish the same end—they make the doctor a better man.

Thus far it has been my purpose to indicate the relation of the progress of medicine, either by laboratory work in the strict sense, or through careful and systematic clinical studies, to your own mental attitude and growth.

This, however, is but the first part of the story; the second part deals with quite another matter. The laboratory has altered the practical and economic situation of the physician in the last few years to an unprecedented degree, and it is concerning this alteration that I wish to say a word.

To-day no physician would remove to the Canal Zone with the idea of making his main practise among those suffering from yellow fever; nor would he to-day expect as an army surgeon to have a great experience with typhoid. In both these instances steps have been taken which lead to the elimination of the diseases named—they simply are not there. I use these instances merely as an illustration of the fact that the health of the community has been protected and bettered in various ways. Thus we recognize that there are mechanical devices sometimes directed against the pathogenic organisms themselves or sometimes against their hosts. Pure milk and pure water mean fewer typhoid organisms—the draining of marshes, fewer places in which pestiferous mosquitoes can breed. The mechanical protection of screens and traps keeps from us disease-bearing flies, and shoes go a long way toward blocking the entrance of the hookworm.

Moreover you have vaccines for smallpox and for typhoid, to name but two, the effect of which is to render the body inhospitable to the organisms against which they are directed. Even when the disease-bearing organism has established itself, it is possible in some instances to kill it within the host, as in the case of the malaria organism and the *Spirocheta pallida.*

When this can not be done and the pathogenic organism is not only active but entrenched—there are antitoxins available, as in the case of diphtheria, by which the poisons that are doing damage can be neutralized, and finally protection of the body in the widest sense can be accomplished by general hygienic measures, so that the inroads of such persistent but unapproachable organisms as the tubercle bacillus may be blocked and prevented.

It is, however, not my object to give a discourse on preventive medicine or public hygiene, but merely to point out that a great deal has been accomplished in bringing under control a number of diseases which heretofore have been treated by the physician single-handed.

Thus one of the ideals of the profession —namely, the prevention of disease—has in recent years made advances toward realization beyond the dreams of the most sanguine a generation ago.

Medicine, like the law, is in a measure engaged in attempting to remove the reasons for its existence. As the feeling for justice and equity grows and the social conscience gains in strength, the law is freed to take up new and larger questions. So when we come to the province of medicine there opens before us a new order of things, arising from our progress in the control and elimination of disease.

The prevention of many important forms of disease has been carried far, but that is only the first step. This condition must be maintained. Here, as elsewhere, eternal vigilance applies. Moreover, new conquests in this field are yet to be made and much devoted labor and keen thinking are needed to that end. This brings the physician more and more into the service of the community at large.

It is in this connection, however, that we find a depressing maladjustment between the community and the physician. All will admit that he who does good to the many is certainly entitled to as definite reward as is the man who benefits a single person. Surely that proposition needs no arguments in its support. Nevertheless, to put the case quite mildly, as matters stand, the man dealing with the single patient is usually the more certain of his remuneration and the more directly recognized. Yet of the two his service is the less.

A fair adjustment of this defect in our social dealings has not yet been found—though certainly it will be. Despite this drawback, however, it can not fail to be a great encouragement for all of us to observe that those working for the public interest and the general good are many and industrious—too occupied with fruitful studies to make much talk about their own misfortunes.

You can not fail to have noted that the progress I have mentioned has been largely in connection with those forms of disease which are due to pathogenic organisms. With these we may contrast the great group in which increasing age and functional misuse and strain seem to be the more prominent factors.

Advances in this field might be noted too, but, passing over these, emphasis is to be laid on the fact that for the proper understanding and control of such diseases one is always seeking help from chemistry —organic, physiologic, biologic, as the case may be. To be sure, the use of chemical ideas by physicians is almost as old as medicine itself, yet the call for such ideas has never been so urgent as to-day, and this call taxes a portion of medical training which, in the past at least, was under-emphasized. It amounts almost to a sudden rearrangement of medical demands, for the commoner ailments, only slowly to be reduced by the gradual enlightenment of the laity, tend to become more and more those which must be met through the control of nutrition and other modifications of our daily life.

Of course when a period of rapid change like that at present in progress occurs in any profession or occupation, there is always created a really tragic situation by reason of the fact that some among the older men have not been taught and can not learn the newer ways, and thus inevitably suffer disadvantage. For them the new ways are bad—and for them the times are out of joint. Naturally the capacity to progress is a highly variable gift, but many instances go to show that it is often thought to be exhausted where there is still much remaining in reserve.

In his discussion of the energies of men, William James has pointed out some possibilities in this direction which both cheer and stimulate. To advance this way sometimes calls for the preliminary removal of worn-out mental furniture. Few of us have escaped some forms of undesirable instruction—we have been given details in place of principles, aid instead of exercise, views as substitutes for demonstrations—and thus in respect to some sorts of knowledge it is as important to know how to let it go as in other cases to know how to grasp the parts worth while. Thus the aim of the progressive man must be to see life steadily and see it whole—prepared to change when change is growth, unwitting of fatigue, and never a worshiper at the shrine of his own past efforts, no matter how strenuous these may have been. Much more might be said upon this topic of the new demands and the adjustment for which they call, but if enough has been given to make you see that a serious problem lies that way my purpose is accomplished.

The moment has now come, as it does to every speaker, to wonder whether success has followed his attempt to reveal what he had in mind. What I have wanted to show you was this: The attitude towards knowledge during our student days is almost necessarily such as to throw the idea of change into the background and unduly to emphasize the permanency of the things then taught. The facts are otherwise.

Change has always been—will always be—and in the near future progress will be more rapid even than to-day. It is to this main fact that I urge you to adjust, for which I encourage you to prepare. The progress with which you have to blend your lives comes from work at the bedside, in the hospitals and in the laboratories and is also a by-product from advances in fields often seemingly remote from medicine.

Moreover, social advances, the growth in the attitude of the community at large—which slowly alters like the form of a great cloud—presents an ever-changing background for the activities of the physician. Two important consequences of this touch you as medical men.

To succeed in truth, you must be prepared continually to replace old knowledge by new and to alter old economic methods and customs to meet the disappearance of some familiar forms of disease and their replacement in your life by newer medical problems and demands often of a general and a public nature.

To the generation of physicians to which you belong this task is allotted and it calls for the best you have to give. Surely the devotion to human welfare can not be less strong with you than with your noble predecessors and no hampering self-interest should be allowed to obscure from you the larger purposes of science and the sacred responsibilities of your profession.

Finally, it is through you that the layman learns of medical progress and its meaning, it is to you that he brings his questions and his doubts concerning methods of experiment and modes of inquiry needful for the advancement of your science, and both your appreciation and support of research in medicine are necessary to keep the public so informed that its representatives and lawgivers shall understand the purposes of this work and grant to it intelligent support.

HENRY H. DONALDSON

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE
A NATIONAL UNIVERSITY BASED ON NATIONAL IDEALS[1]

BEFORE such a learned organization it is not necessary to dwell on the development of the modern university from its ancestral

[1] Address before the Section of Education at the Cleveland meeting of the American Association for the Advancement of Science.